REMARKS

After entry of the foregoing amendment, claims 1-50 are pending in the application.

A substitute specification is submitted herewith. The amendments made in the substitute specification – compared with the originally-filed specification – are detailed in the notes appended to the end of this document.

The claim amendments made above are also reflected in the substitute specification.

Most of the drawings originally submitted with the application have been deleted as superfluous, since the substitute specification now refers to issued patents containing the same drawings (which patents are incorporated by reference). A set of substitute drawings comprising original Figs. 1-7 has been retained (corresponding to Appendix D), and a figure originally presented as Fig. 1 (corresponding to Appendix H) has been re-submitted, now renumbered as Fig. 8.

A "Detailed Description" section has been added to the specification. This text simply comprises wording from the originally-filed claims – rewritten in narrative form.

No new matter has been entered.

The undersigned apologizes to the Examiner for the non-conventional form of the specification (which hopefully has been significantly redressed by the Substitute Specification), and for the Examiner's time and effort expended by reason thereof.

Claims 5-7, 9-11, 17, 22, 24-26, 28, 37, 38, 43, 44 and 47 were objected-to, and have been rewritten in independent form.

The remaining claims have been rejected, over Gasper (5,919,730) – individually, or in combination with other art.

Applicants respectfully submit that Gasper does not teach an arrangement that encodes "plural bits of digital data," as required by the claims. Rather, the marking effected by Gasper's technique would seem to be akin to a single bit signal, signifying "Do Not Copy."

The reference at column 8, lines 15-21, of Gasper to "unique signatures" is understood to allow for different patterns to be used in different documents. But there is still no teaching of multi-bit binary data encoding.

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An imperfect analogy is fonts. An 'A' can be printed on various documents in various ways to distinguish the documents, e.g., A, 𝔅, 𝒜, A, 𝒜, 𝔄, etc. Each document conveys the same information, but it is represented differently – permitting the documents to be distinguished. In like manner, Gasper teaches that different patterns be used to distinguish documents. Yet he does not teach multi-bit binary data encoding.

On other points, too, it appears the Examiner has accorded Gasper a broader interpretation than the reference warrants.

Applicants have submitted new claims 49 and 50, which introduce a limitation that further distinguishes Gasper. Depending on how prosecution proceeds, applicants may be willing to incorporate such limitations into independent claims 1 and 30 if it might expedite allowance of the application.

Applicants respectfully traverse the anticipation rejection of claim 40. That claim requires, *inter alia*, a "noise-like pattern." Gasper does not appear to teach any noise-like pattern. Rather, inspection of his exemplary patterns (Figs. 5A-5D) shows each to be highly ordered. Accordingly, this claim has been rewritten in independent form, incorporating the language of unamended base claim 30. Favorable reconsideration is solicited.

Applicants also traverse the rejection of claims 18 and 19 over Gasper + Wang (5,471,533).

The Action states that Wang teaches *"that the digital data can serve as an index to a registry that includes additional information."* However, this is not the limitation expressed in claim 18 or claim 19.

Instead, claim 18 requires that *"said plural bits of digital information comprise an identifier, said identifier serving to convey information indicative of an electronic address."* Wang is not understood to teach this.

The excerpt of Wang cited in support of the rejection of claim 18 and 19 states:

> *The slight variations could be determined in a variety of ways. For example, if record 316 is a bearer bond on a stock certificate, processing means 24' could be a large computer or a computer network which keeps track of redemptions. Processing means 24' could also receive data on either the interpretation of the information or the printing of the information using entering means 22'.*

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This excerpt appears to refer to an apparatus that reads and modifies a printed document (col. 9, lines 38-39). In particular, the apparatus modifies the printed document to reflect that a bearer bond or stock certificate has been redeemed. No electronic address is taught by Wang.

Claim 19 is even further removed from the teachings of Wang. Claim 19 requires:

- that the plural bits of digital information comprise an identifier;
- the identifier comprises a pointer into a remote data structure; and
- the remote data structure stores an electronic address corresponding to the substrate.

Wang does not appear to teach, *e.g.*, a data structure storing an electronic address corresponding to the substrate.

Still further, the rejection of claims 18 and 19 is predicated on the base reference – Gasper – teaching plural bits of digital information. Again, applicants respectfully submit that Gasper's encoding cannot be resolved into the requisite plural bits of information required by the arrangements of these claims.

Moreover, applicants submit that an artisan would not have been led by the art to combine Gasper and Wang in the manners asserted.

It will be remembered that Gasper's object was to provide a copy-restrictive document (or copy-restrictive blank media on which a document could thereafter be printed). It is not clear why an artisan confronted with Gasper's copy-restrictive document would have found it deficient, and in need of *any* modification. (The modifications suggested in the Action do not aid Gasper's objective.)

Wang, on the other hand, concerns printed documents which contain both machine-readable data, and images (column 1, lines 17-19: "*The present invention relates generally to records which contain both machine-readable representations of data and images...* ").

It will be recalled that claims 18 and 19 are directed to substrates "to which final user printing can be later applied to yield a final printed object." Wang's teachings, concerning *printed* documents, would not seem applicable to such substrates - absent

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hindsight. (Additionally, there is no rationale offered why an artisan would choose to disregard Wang's emphasis on documents that include images.)

Moreover, the Action refers to Wang's use of ink that is transparent to visible light. Adoption of such a teaching would seem to defeat the claims' requirement *"said steganographic pattern being detectable by visible-light scanning of the substrate."* (If the ink is transparent to visible light, it would not seem to be detectable by visible light scanning.)

In view of the art's above-noted failure to teach each element of the claims, and the failure of the art to incent an artisan to selectively adopt certain teachings of the references, modify others, and disregard still others - all as required by the claims, it is submitted that a *prima facie* case under § 103 has not been established.

Applicants also respectfully traverse the rejection of claims 20 and 39 over Gasper in view of Szepanski (DE 2943436).

Szepanski appears to disclose an encoded protective pattern that includes – around the margin – an overt pattern of periodic tic marks ('4,' Fig. 2). Concerning these marks, Szepanski states *"In addition to the surface patterns 3, markings 4 are provided, which are necessary for reading and decoding of the authenticity information contained in the protective pattern"* and *"[M]arking 4 is used for synchronization of the scanner."*

It is not clear – from Szepanski's specification – that the tic marks (4) serve as an "orientation signal," as required by applicants' claims. "Synchronization" – the term used in the translation of Szepanski – is defined by dictionary.com to mean "to operate at the same time" or "to occur in unison." "Orientation," in contrast, refers to angular presentation.

Additionally, it will be noted that the claims require a *steganographic* orientation signal. Szepanski's markings (4) are not understood to be steganographic, but rather appear overt.

Accordingly, applicants respectfully submit that the art cannot be combined to yield the arrangement of claims 20 and 39.

Moreover, applicants further submit that there is no basis for the proposed combinations in the art. In particular, it is noted that Gasper's detailed arrangement does not need an orientation signal. Gasper notes:

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> *We see from this example that the copy restrictive portrait print is not allowed to be copied. <u>This is true regardless of how it is oriented when it is placed on the scanner</u>.*

Gasper, col. 18, lines 58-60. Accordingly, an artisan would have no incentive to provide any orientation signal in the Gasper arrangement.

Again, withdrawal of the § 103 rejection of claims 20 and 39 is requested.

Favorable reconsideration is solicited.

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Respectfully submitted,

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Notes

The following Notes detail how the originally-filed specification has been changed to yield the Substitute Specification:

The text extending between page 1, line 5, and page 2, line 8 of the original spec has been amended as follows:

The present application is a continuation-in-part of each of the following applications:

- 09/127,502, filed July 31, 1998 (~~attached as Appendix A~~ **now Patent 6,345,104**), which is a continuation-in-part of 08/967,693, filed November 12, 1997 (now Patent 6,122,392), which is a continuation of 08/614,521, filed March 15, 1996 (now Patent 5,745,604), which is a continuation of 08/215,289, filed March 17, 1994, now abandoned;

- 09/498,223, filed February 3, 2000 (~~attached as Appendix B~~ **now Patent 6,574,350**), which is a continuation in part of 09/287,940, filed April 7, 1999 **(now Patent 6,580,819)**, which claims priority to 60/082,228, filed April 16, 1998; the '223 application also claims priority to 09/433,104, filed November, 3, 1999 (~~attached as Appendix C~~ **now Patent 6,636,615**), which is a continuation in part of 09/234,780, filed January 20, 1999 **(abandoned)**, which is a continuation in part of application 60/071,983 filed January 20, 1998; and

- 09/553,112, filed April 20, 2000 (attached as Appendix D**, now abandoned**), which claims priority from application 60/131,005, filed April 22, 1999;

- 09/562,516, filed May 1, 2000 (attached as Appendix E)

- 09/562,524, filed May 1, 2000 (~~attached as Appendix F~~ **now Patent 6,724,912**);

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- 09/571,422, filed May 15, 2000 (~~attached as Appendix G~~ <u>international counterpart published as WO00/70585</u>);

- 09/619,264, filed July 19, 2000 (attached as Appendix H);

- 09/629,401, filed August 1, 2000 (~~attached as Appendix I~~ <u>now Patent 6,522,770</u>);

- 09/631,409, filed August 3, 2000 (attached as Appendix J);

- 09/633,587, filed August 7, 2000, which is a continuation-in-part of 09/343,104, filed June 29, 1999 <u>(abandoned in favor of continuation application 10/764,430)</u>, which is a continuation-in-part of 09/314,648, filed May 19, 1999 <u>(now Patent 6,681,028)</u>.

- 09/640,806, filed August 17, 2000 <u>(now Patent 6,438,231)</u>;

- 09/689,289, filed October 11, 2000 (attached as Appendix K), which is a continuation-in-part of 09/567,405, filed May 8, 2000;

- ~~Application 09/_____, filed March 9, 2001 [attorney docket EWG-140 - Watermarking a Carrier on Which an Image Will be Placed or Projected]~~ <u>09/803,167, filed March 9, 2001</u> (~~attached as Appendix L~~ <u>now published as US 20020126871</u>).

Claims directed to blank paper media have earlier issued to the present assignee in patents 5,850,481, 5,822,436, and 6,111,954, and have been indicated as allowable (subject to Terminal Disclaimer) in application 09/640,806 <u>(now patent 6,438,231)</u>.

The text extending between page 2, line 24, and page 3, line 5 of the original spec has been amended as follows:

For those situations in which the marking needs to be both inconspicuous and low cost, digital watermarking offers a promising alternative. Digital watermarking involves making subtle changes to a substrate's appearance (e.g., by ink speckling, texturing, background printing, or other techniques detailed in the literature) -- changes that generally pass unnoticed by human viewers but that

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can be sensed by optical techniques (e.g., webcams, scanners, digital cameras) and decoded by computer processing of the resulting image data to extract the encoded information. Application 09/503,881 **(now patent 6,614,914)** details illustrative watermark encoding/decoding technology. A great number of other techniques are known to artisans in the field, and can be alternatively used. (The following specification commonly uses the term "watermarking" as shorthand for "digital watermarking." This steganographic form of digital data encoding is different than the paper watermarks that have, for centuries, been used in certain documents.)

The text extending between lines 9 and 27 of page 3 of the original spec has been amended as follows:

Application 09/640,806 **(now patent 6,438,231)**, with priority back to application 08/215,289, filed March 17, 1994 (through intervening patents 5,822,436 and 6,111,954) teaches that blank photographic paper and photographic film can be pre-processed – before exposure – to encode digital watermark information. When the paper/film is thereafter developed, the encoded information permeates the exposed image. That application also discusses substrate texturing as a way of effecting digital watermarking.

Application 09/127,502 **(now patent 6,345,104)** teaches how a watermark pattern can be formed in the background of a printed document, such as by speckling small droplets of ink, or printing a mesh or weave of very thin lines. Ink-jet, intaglio, offset litho, letterpress, xerography, and other printing processes can be used. Such printing can be used to impart a tint to paper while simultaneously encoding auxiliary data (the watermark payload). Watermark encoding by texturing, such as by use of embossing pressure rollers or intaglio plates, is also discussed. Such processes can be performed by the end-user of the paper, or earlier, e.g., by a paper manufacturer. Moreover, they can be applied to the base substrate, or to a laminate layer (which may be clear) that is applied to the base substrate. The background patterning can encode both the auxiliary data

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payload, and calibration/orientation information that helps the decoder determine (and compensate for) rotation or scaling of the scan data prior to decoding. The encoding can extend across the entire document/substrate, or can be restricted to certain areas.

The text extending from page 3, line 28 through page 4, line 2, has been amended as follows:

Application 09/562,524 **(now patent 6,724,912)** particularly considers watermarking of laminate layers and synthetic substrates by techniques including opacification, laser ablation and cutting, and gravure printing. This application also considers how a single sheet of blank media can be encoded to convey different watermarks in different regions.

The text extending between lines 3 and 17 of page 5 of the original spec has been amended as follows:

Applications 09/498,223 **(now patent 6,574,350)** and 09/433,104 **(now patent 6,636,615)** detail "fragile" digital watermarks, i.e., watermarks that are designed to be lost, or to degrade in a predictable manner, when subject to certain forms of processing (e.g., scanning and printing, or photocopying). A watermark may be made fragile in numerous ways. One form of fragility relies on low watermark amplitude. That is, the strength of the watermark is only marginally above the minimum needed for detection. If any significant fraction of the signal is lost, as typically occurs in photocopying operations, the watermark becomes unreadable. Another form of fragility relies on the watermark's frequency spectrum. High frequencies are typically attenuated in the various sampling operations associated with digital scanning and printing. Even a high amplitude watermark signal can be significantly impaired, and rendered unreadable, by such photocopying operations. Fragile watermarks can be combined with more traditional, "robust" watermarks within a single document. The former serves to

authenticate the document as an original. The latter serves to tag the document with a persistent set of auxiliary data (which can be used for any of the purposes for which watermarks are used).

The text extending between lines 3 and 20 on page 6 of the original spec has been amended as follows:

Application 09/629,401 **(now patent 6,522,770)** details how office documents, such as printed spreadsheets, can include a background (or other) watermark pattern. When presented to a webcam, or other such device, an associated computer can decode the watermark and, from this information, identify where the document is stored. The document can then be loaded from such storage, and a corresponding program launched to permit on-screen review or editing. Meta-data associated with the document can also be recalled by reference to the watermark. The encoding of the watermark in the printed output can be effected transparently to the user, such as by the application program (Excel), by printer driver software, or by the printer itself.

~~Application_____ [attorney docket EWG-140]~~ **Application 09/803,167, filed March 9, 2001 (now published as US 20020126871)** details how a substrate can be treated so that, when printed with unwatermarked text or imagery, the resulting document will be watermarked. This can be done, e.g., by locally tailoring the ink absorption attributes of different regions on the page, such as by a finely patterned waxy coating.

Detailed Description

In accordance with one aspect, an embodiment of the invention is a substrate to which final user printing can later be applied to yield a final printed object. The substrate is characterized by having been processed prior to final user printing to yield a steganographic digital watermark pattern thereon. This pattern does not impair subsequent use of the substrate, yet conveys plural bits of digital information. The presence of such information is not apparent to a human observer of the substrate, but

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can be detected by visible-light scanning of the substrate to yield data from which the plural bit information can be recovered.

The steganographic digital watermark pattern can be formed by ink, which may be, e.g., speckled across at least part of the substrate. Or the ink can form a mesh of thin lines. (For example, the mesh can comprise a single pattern that is tiled across the substrate, with the pattern being arranged so that lines located at adjoining tile edges meet without discontinuity.) Such inking can serve to impart a colored tint to the substrate, and may be applied by known ink-jet printing processes.

The watermark pattern may also be defined by generating a tile specifying one of N luminance values for each of plural different areas, consolidating the N values down to M (where M < N), and then forming lines between such areas in response to the consolidated luminance values. The user may specify line criteria to be used, including whether the lines are straight or curved, and if curved parameters therefor.

The ink used in forming the watermark pattern can be of known types, including clear. The ink may be chosen to optimize watermark detection in the presence of expected illumination spectra, e.g., the illumination cast by a computer monitor.

In other embodiments the steganographic digital watermark pattern can be formed by texturing the substrate (e.g., by force of pressure, by embossing, by an intaglio plate, etc.).

In still other embodiments, the substrate can be processed to locally change its ink absorption ability.

In yet other embodiments, the substrate can include a photographic emulsion, and the watermark pattern can be formed by exposing the emulsion with a pattern (e.g., a noise-like pattern) and thereafter developing the emulsion to make the pattern detectable.

The pattern can be formed on the substrate prior to delivery of the substrate to an end user, e.g., by a producer or supplier of the substrate. Alternatively, the pattern can be formed on the substrate after such delivery.

In some embodiments, the digital watermark pattern may degrade when photocopied, so that the printed object can be distinguished from a photocopy. Such embodiments may also include a second digital watermark pattern – one that is robust against photocopying.

Depending on application, the digital watermark pattern may extend across an entire face of the substrate, or be restricted to certain areas. Likewise, only one side of the substrate – or both – can include watermark patterns. In substrates with laminate construction, the digital watermark pattern may be manifested in a laminate layer. In some embodiments, different regions of the substrate can convey different watermark payloads.

The plural bits of digital information represented by the watermark pattern can comprise an identifier that serves to convey information indicative of an electronic address. More particularly, the identifier can comprise a pointer into a remote data structure, with the remote data structure storing an electronic address corresponding to the substrate.

In some embodiments, the watermark pattern on the substrate may also convey a steganographic orientation signal.

To permit a document printed on such a substrate to be uniquely identified from other – seemingly identical – printed documents, the plural bits of digital information represented by the watermark can comprise serialization information. Alternatively, the digital information can serve to identify the type of substrate to a printer, so that the printer can tailor print parameters accordingly.

The watermark pattern may be formed on a side of the substrate opposite that to which final end-user printing is later applied.

Secret knowledge may be required to decode the plural bits of digital information from the substrate. Thus, a first end user cannot decode information encoded on a substrate of a second end user, and vice versa.

The substrate can take different forms, including an envelope, stationery, etc. The substrate can also comprise printing stock, such as for a

security document (e.g., a banknote) or for newspapers and magazines. Or the substrate can comprise a printed check.

   The [foregoing] summaries **of the priority applications noted earlier** are necessarily abbreviated and incomplete; the reader is referred to the cited applications for their full disclosures. Moreover, the disclosures discussed in connection with one application or technology may have antecedents in earlier applications. Again, the reader is referred to the cited applications.

Appendix A has been deleted (pages 7-29, inclusive).

Appendix B has been deleted (pages 30-38, inclusive).

Appendix C has been deleted (pages 39-51, inclusive).

The text in Appendix D, at page 52, lines 9 – 10, has been deleted.

The text in Appendix D, at pages 59 through 61, has been deleted.

The text in Appendix E, at pages 69-70, has been deleted.

Appendix F has been deleted (pages 72-78, inclusive).

Appendix G has been deleted (pages 80–181, inclusive).

In Appendix H, the references to "Fig. 1" have been changed to "Fig. 8."

The text in Appendix H, at pages 187-188, has been deleted.

Appendix I has been deleted (pages 190-202, inclusive).

The text in Appendix J, at pages 206-207, has been deleted.

The text in Appendix K, at page 209, lines 5-8, has been deleted.

The text in Appendix K, at pages 221-222, has been deleted.

Appendix L has been deleted (pages 224-230, inclusive).

The spelling of 'stationery' in the Abstract has been corrected.

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